PROCESSING OF INFORMATION IN ORGANISMS: PATTERN RECOGNITION, CONCEPTUALIZATION AND PROBLEM SOLVING

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16. Abstract

A paper on the theoretical, informational and psychological modelling of thought and decision-making processes was read by Professor O. K. Tikhomirov at the International Symposium "Information Conversion in Organisms" (11-14 September 1973, Berlin). Professor Tikhomirov stressed the concept of thought as a problem-solving action and discussed three aspects of this process: setting up a goal, perception of a problem as a goal in in the given circumstances, and formulation of the problem. Human thought processes and computer "thought" processes were compared.

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The International Symposium "Processing of Information and Organs,"   /181*
organized by the Society of Psychologists of the German Democratic Republic
jointly with the psychology section of the Humboldt University, Academy of
Sciences of the GDR and Central Institute of Cybernetics and Information
Processes, was held in Berlin on 11-14 September 1973 at the Humboldt Univer-
sity. In opening the symposium the president of the Society of Psychologists
of the GDR, Professor F. Kliks presented a detailed description of the basic
problems of each of the three sections of the symposium. The problems of
information processing and organisms were examined in terms of pattern
recognition, conceptualization and problem solving. The three stated sections
were held consecutively. The symposium attracted a wide community of
psychologists and specialists from Allied Sciences from Czechoslovakia, Poland,
Bulgaria, West Berlin, West Germany, Holland, Sweden and the United States.
The director of the Central Institute of Cybernetics and Information Processes
of the Academy of Sciences of the GDR, Professor Fel'ts, greeted the symposium.

The working languages of the symposium were German, Russian and English.
Brief theses of the reports to be presented were published in advance of the
symposium. The complete text of the reports and their discussion, and also
materials of the concluding colloquium round table discussion, to be published
in 1974. The symposium was the first of a series of international symposia,
organized by the Society of Psychologists of the GDR in preparation for the
22nd International Psychological Congress, which will be held in Leipzig in
1980.

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*Numbers in the right hand margin indicate pagination in the foreign text.

Professor O. K. Tikhomirov of the USSR presented a report at the first meeting concerning urgent theoretical problems of theoretical-information and psychological modelling of thought processes, or decision making, as it has come to be known in cybernetics. The report evoked lively interest from the participants of the symposium. Professor D. Norman of the United States and Professor O. Gryusser of West Germany, Professor F. Kliks of East Germany asked several questions of the speaker. The discussion continued basically on problems of the relationship between the psychological and theoretical-information approaches to the problem of thought, and the relation between human thinking and computer "thinking". O. K. Tikhomirov stressed that thought is psychologically problem solving activity and discussed in this connection three aspects of the investigation of thought in psychological research: first, establishing a goal, second -- recognizing the problem as a goal, given under specific conditions, and third -- formulation of the problem. On the basis of the works of S. L. Rubinshteyn, P. Ya. Gal'perin and other Soviet psychologists, O. K. Tikhomirov characterized the state of the art and trend of development of creative thinking.

The problem of pattern recognition was discussed during three meetings of the symposium: classification and evaluation of perception, adaptation and learning during pattern recognition, decision making strategies during pattern recognition, recognition of problems and the structure of the human memory, pattern structure recognition, pattern recognition in the man-machine system, identification of recognition levels and their applications. Reports were presented by the following: V. Sarris (West Germany) -- "Judgements After Perception In Psychophysics; On Simple Tests Or Studying An Information Integrating Model, On The Contrast Effect in Perception"; P. Pettsol'd (GDR) -- "Mechanisms Of Distinction Of Acoustical Power"; V. Kvaas (GDR) -- "The Dependence Of The Formation Of Structure And Effectiveness Of Visual Achievements In Classification"; Professor O. Gryusser (West Berlin) -- "Adaptive Achievements of Invariation With Visually Given Patterns"; A. Sanders (Holland) /182 -- "Experimental Comparison Of Various Requirements During Investigation Of Short Term Memory"; Ya. Rote and R. Zeyfert (GDR) -- "Achievements of Search During Variation Of The Distance Between Signal Elements"; V. Khukker (GDR) -- "On The Effectiveness Of Various Contents Of Hypotheses For Classifying Complex

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Patterns"; D. Kovach (Czechoslovakia) -- "Pairing - An Open Problem In The
Information Processing"; F. Kliks (GDR) -- "Structure, Description Of Structure
And Achievements Of Recognition"; Ye. Levenberg (Holland) -- "On The Perceptive
Language For Coding Three-Dimensional Patterns And Acoustical Symbols". Other
reports were also presented.

Two meetings were held on the problem of conceptualization and classifi-
cation (second part of the symposium). Several aspects of this problem were
discussed: deterministic sets and conceptualization, statistical conceptuali-
zation, human strategies during conceptualization, human diagnostic strategies
and automatic diagnosis, classification strategies and their application, human
memory and conceptualization, procedural problems in investigation of concept-
ualization, formation and choice of criteria in conceptualization, semantic
conceptualization. The following presented reports: R. Shtrobel, F. Kukla and
F. Kliks -- "Strategic And Structural Analysis Of Undefined Terms"; V. Kinch
(USA) -- "Processing Of Nonexplicit Information During Reading"; S. Ertel' (West
Germany) -- "Affective Thought And Deductive Meaning"; M. Birvish (GDR) -- "On
The Principles Of Semantic Conceptualization"; R. Ul'brikh and F. Vysotskiy
(GDR) -- "Experiments With Structures Of Decisions In Statistical Classifi-
cation"; L. Shpring, R. Shtrobel' and S. Leonard -- "Component-Wise Analysis
Of Diagnostic Processes As A Conceptual Analogy To Classification Problems";
Kh. Bok, F. Kukla (GDR) et al., -- "Psychological Investigations For Determin-
ing Criteria for Ranking".

Two meetings were also held on the subject of problem solving (the third
basic problem of the symposium). New theoretical approaches to investigation
of problem solving, classification of problems and solution methods, structures
in problem solving, collection of information during the problem solving
process, semantic systems and problem solving, problem solving in the man-
-machine system, problem solving methods and their application in various
disciplines, were all discussed. The following presented reports: D. Derner
(West Germany) -- "On Elementary Processing of Information During Problem
Solving"; Kh. Sedov, B. Delde, Kh. Khagendorf (GDR) -- "Analysis of Structural
Recognition in Problem Solving Processes With Scaling"; Ya. Skundura, Ya. Durnin
and V. Vulfek (USA) -- "Hierarchical Characteristic of Heuristic Methods of

Solving Constructive Problems in Geometry"; A. Zeeber and Ya. Rikhter (GDR) --
"Development Of A Program Of Equations On The Basis Of Algorithmic Descriptions
Of Problems". The reports of Ye. Kester (GDR) and E. A. Faraponova dealt with
the pedigogical aspects of the examined problem: achievement of anticipation
by children during a solution of various problems; investigation of industrial
thinking and its trends of development by Soviet psychologists. V. Brikhachek
and Z. Zastavka (Czechoslovakia) presented a report entitled "On Realization Of
Negative Information In Problem Solving". The concluding session of the third
part of the symposium heard reports by Professor D. Norman (USA) -- "The
Structure of Memory And Linguistic Understanding"; Ye. Leman (GDR) -- "Involve-
ment of Learning Processes In A Model of Problem Solving"; Ye. Sandvel (Sweden)
-- "Deductive Search In A Semantic System". B. Krauze, B. Keyl, Kh. Lander
(GDR) reported "On The Action of Partial Knowledge Through the Structure of
Problems On The Problem Solving Processes"; V. Krauze and S. Gladigad (GDR) --
"On The Relation Between Information Retrieval And The Direct Search For The
Answer In Problem Solving".

In spite of the fact that the program of the symposium included a con-
siderable number of reports, each report was discussed at length immediately
after its presentation. The concluding colloquim was held on the afternoon of
the 14th of September, the day of conclusion of the symposium. It was organized
so that at the beginning of this discussion each of the participants would have
the opportunity of presenting a question for final discussion, and then all
questions were put to a vote (each participant could vote only once), and the
three problems that collected the most votes were selected for discussion. The
problems of the relationship between modelling in psychology and empirical
experimental studies, various interpretations of information processes, experi-
ment in theory in modern psychology, the study of emotions and motivational
processes and their significance for learning, were considered during the
round-table discussion. The materials of the symposium will be published in
1974.